Comprehensive Emergency Management Plan

FLOOD WARNING PROGRAM ANNEX E

March 16, 2021

COLLIER COUNTY FLOOD WARNING PROGRAM

I. INTRODUCTION:

A. Purpose

1. This program establishes a framework through which Collier County may provide warning, prepare for, mitigate the impacts of, respond to, and recover from salt water or freshwater flooding events that could adversely affect the health, safety and general welfare of Collier County residents and visitors.

2. Provisions are made for the needed flexibility of direction, coordination and method of operation to enable government and non-government entities to accomplish their objectives of mitigation, preparedness, response and recovery. This Annex also provides the framework for rendering support to other counties, municipalities, States and the Federal government in their flood management efforts.

B. Scope

The Collier County Flood Warning Program

1. Describes the various types of flooding that could occur and provides procedures for disseminating warning information and for determining, assessing and reporting the severity and magnitude of flooded areas,

2. Establishes the concepts under which the county government will maintain a 24/7 flood warning program, and

3. Creates a framework for expeditious, effective and coordinated employment of local resources.

4. The County Emergency Management Office administers/disseminates flood warning information to the municipalities and all response operations are conducted under the authority of this Collier County Comprehensive Emergency Management Plan (CEMP).

5. Supports Collier County’s participation in the NFIP CRS Program’s Activity 610.

C. Assumptions

1. The State agencies of Florida have certain expertise and resources at their disposal that may be used in relieving emergency or disaster and flood related issues that are beyond the County's capability.

2. When the County declares a State of Local Emergency and requests State assistance following a flooding disaster, the Governor may issue an Executive Order about this emergency and the State Emergency Operations Center (SEOC) may be activated if conditions warrant.

3. Should State assistance be inadequate to cope with the flooding disaster, the Governor will request Federal assistance under a Presidential Disaster Declaration.

4. The National Weather Service Office (NWSO), Miami, will issue flood advisory, watches and warning information to both Government and the citizens. The State Watch Office will follow-up the NWSO's warning information with direct contact with the local Emergency Management Office (duty hours) or the Collier Sheriff's Office (non-duty hour warning point).

5. South Florida Water Management District's Big Cypress Basin office possesses real-time hydrologic data on its canal system to enable it run real-time flood modeling and decision-making support system for operation of the water control gates. Should the canals fill above the "red Alert level" and email warning will be sent to both the water management district representatives and the emergency management staff that "possible flooding conditions" exists.

6. Collier County does not have any major rivers, there are no stream profiles on the FEMA Digital Flood Insurance Rate Map (DFIRM), and rainfall-induced flooding produces very slow moving sheet-flow conditions that are shallow but can be broad in aerial extent. Collier County is basically its own watershed with very little contributing area of sheet-flow from Lee County to the north or Hendry County to the northeast.

7. The only flooding which poses a large-scale threat to property and the possibility of loss of life stems from storm surge flooding. Flooding due to rainfall is typically nuisance flooding and may present only a threat to property.

D. Situation

1. Because of the seasonal possibility of large-scale flooding events within Collier County, the County must be adequately prepared to react to, reduce vulnerability to and recover from these flood emergencies. The Emergency Management Functions, within the County, must be coordinated as much as possible with other local government and non-governmental agencies as well as with the State Division of Emergency Management and surrounding jurisdictions to ensure the most effective preparation and use of manpower, resources, and facilities in response to flood threats and/or emergencies.

2. The subtropical weather of southwest Florida, its low relief topography and rapid human encroachments into our natural wetlands have made us vulnerable to frequent floods and droughts. The flood conveyance capacity of our drainage system, particularly in the Golden Gate Estates, is limited, as the canals were

primarily constructed to lower the water table for building home-sites, and not designed to effectively carry runoff from large storm events. Despite numerous enhancements made to our canals and water control structure network, they remain deficient for providing the desired levels of flood protection of eastern Golden Gate Estates area.

3. The principal causes of flooding affecting Collier County are as follows:

   a. Hurricanes/tropical storms generate high winds, wave action along the coast and widespread flooding over much of the populated area of the County. Saltwater intrusion from the storm surge has the potential to affect 90% of the population depending on the intensity of the storm. Although tropical systems can form during any month of the year, hurricane/tropical storm season begins on June 1 and ends on November 30.

   b. Other weather systems, both tropical and non-tropical, which may or may not have an identifiable low-pressure center, can produce up to 20 inches of rain over a three-day period. These also occur primarily during the hurricane season but can occur at other times. This flooding can cause canals and rivers to overflow their banks and could be aggravated by slightly above normal tides.

   c. Severe thunderstorms, which are local in nature, can cause isolated flooding from torrential rains, and may or may not be accompanied by high winds. These usually occur late May to late September but can occur at any time of the year. (See Attachment 1 of this annex for locations prone to standing water ponding.)

II. HAZARDS ANALYSIS AND DEMOGRAPHICS

A. Hazards Analysis

1. History: Hurricanes/tropical storms provide the greatest flood threats to Collier County. A listing of all hurricanes/tropical storms that came within 50 miles of Naples since 1842 is provided as Attachment 2 to Annex E. The coastal area of Collier County has been exposed to 80 hurricanes/tropical storms since 1842. (Source: https://bit.ly/32FoJQK). Type and frequency are as follows:

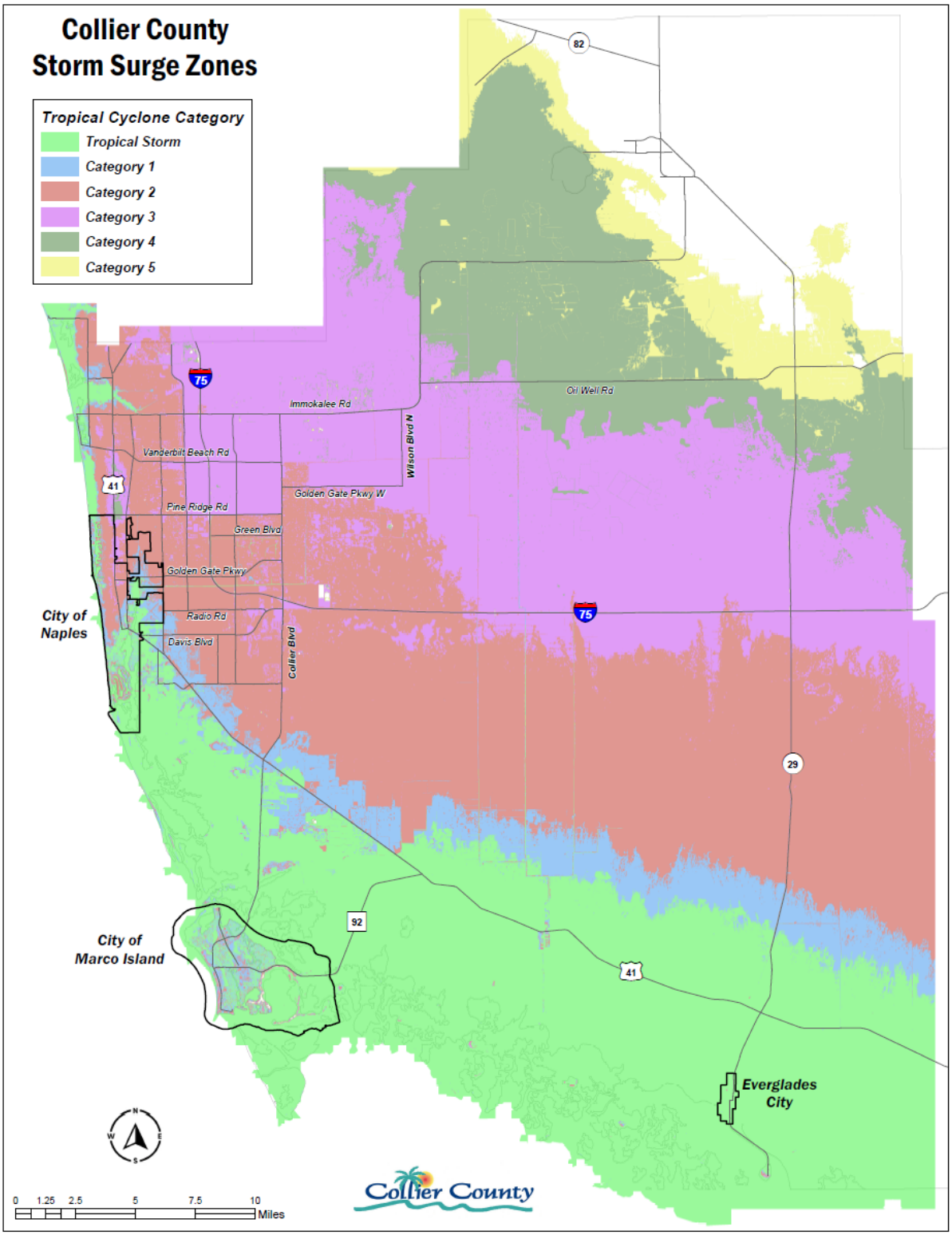
Tropical Storm	39	(1 in 4.6 years)
CAT 1 Hurricane	10	(1 in 18.0 years)
CAT 2 Hurricane	13	(1 in 14.0 years)
CAT 3 Hurricane	7	(1 in 25.7 years)
CAT 4 Hurricane	9	(1 in 20.0 years)
CAT 5 Hurricane	2	(1 in 90.0 years)
TOTAL	80	(1 in 2.3 years)

[Hurricane Totals 41 (1 in 4.4 years)]

Wind: SAFFIR/SIMPSON SCALE

(NOTE: This scale is a "wind-scale" and no longer tied to a corresponding storm surge in a real-time tropical event threatening. In the case of a real-time event, the storm surge will be described separately from the tropical windstorm category.)

Category	Wind Speed
Tropical Storm	39-73 MPH
Category 1	74-95 MPH
Category 2	96-110 MPH
Category 3	111-129 MPH
Category 4	130-156 MPH
Category 5	157+ MPH


Collier County
Storm Surge Zones
Tropical Cyclone Category
Tropical Storm
Category 1
Category 2
Category 3
Category 4
Category 5
82
75
Immokalee Rd
Oil Well Rd
Wilson Blvd N
Vanderbilt Beach Rd
41
Golden Gate Pkwy W
Pine Ridge Rd
Green Blvd
Golden Gate Pkwy
City of
Naples
Radio Rd
Davis Blvd
Collier Blvd
75
29
92
City of
Marco Island
41
Everglades
City
N
W
E
S
0 1.25 2.5 5 7.5 10
Miles
Collier County

Storm Surge: The storm surge modeling tool we use, SLOSH, comes from the National Hurricane Center. In the sense of how we are using it here, it is a planning tool, only. When we are threatened by a tropical cyclone, we will speak of the storm surge threat separately from the category/type of the tropical cyclone. For the purposes here, using the surge modeling tool the hurricane center has modeled the worst-case hurricanes possible to impact Collier County in order to give us the "Maximum of Maximum" (MOM) storm impacts per category of storm. (See Figure 22 in the Basic Plan)

Residents living along the coast, south and west of US 41 have the most repeated threat potential from hurricanes or tropical storms. Using the Property Appraiser's parcel data to identify residential structures the following represents the at-risk population estimate of those exposed to the worst of the worst-case hurricane scenario for each category: the MOM.

70,140 (37%) are in a Tropical Storm/Category 1 zone.
142,701 (79%) are in a Category 2 zone.
176,736 (97%) are in a Category 3 zone.
178,624 (97%) are in a Category 4 zone.
179,015 (97%) are in a Category 5 zone.

Due to the trajectory of these storms, it is estimated that only 3 storms caused significant storm surge flooding to the Greater Naples urban area. The urban area is defined as that area west of a line from one mile east of Collier Boulevard to the coast. The four storms that generated storm surge flooding were:

Oct. 7, 1873 CAT 3 Surge est. 8 to 11 feet MSL
Sept. 25, 1894 CAT 3 Surge est. 10 to 11 feet MSL
Sept. 10, 1960 CAT 4 Max. Surge N Naples 11.86 feet MSL
Sept. 28, 2022 CAT 4 Max. Surge

The Everglades City area has experienced many more flooding events. The most recent occurrence was on September 10, 2017 with Hurricane Wilma.

a. A Category 2 land falling or paralleling storm with a storm surge of six to eight feet would force the evacuation of most of the coastal area to the south and west of US41. Goodland and Isle of Capri residents are particularly vulnerable since each area has only one ingress/egress road and both roads are susceptible to flooding when heavy precipitation coincides with the astronomical high tide.

b. A Category 3 storm with a storm surge of 9-12 feet could result in the evacuation of 92% of the residential population within Collier County.

c. The following hurricane/tropical storms affected coastal Collier County since 1960.

(1) ***Hurricane Donna (Cat 3) - 1960*** - was the last hurricane to affect Collier County to any great degree. It was a paralleling storm that hugged the coast from Everglades City to Bonita Shores. At the time of the hurricane, the County's population was approximately 15,600 including Everglades City and Naples. Storm surge with Donna occurred inland to the intersection of 6th Avenue South and 9th Street in the City of Naples.

(2) ***Hurricane Isbell (Cat 2) - 1964*** - entered the S.W. Florida coast just north of Cape Sable. There was little, if any, flooding associated with this storm over the populated area of the County.

(3) ***Hurricane Alma (Cat 2) - 1966*** - remained off the west coast of Florida until it made landfall south of Tallahassee. Its closest point of approach was 49 miles WSW of Naples. There are no reports of significant damage to Collier County.

(4) ***Tropical Storm Abby - 1968*** - was a paralleling storm off the Collier County coast. It had maximum winds of 57 knots and made landfall near Charlotte Harbor. No reports of significant flood damage to Collier County.

(5) ***Tropical Storm Jenny - 1969*** - had a similar track to Abby. It had maximum winds of 37 knots and made landfall near Sanibel Island. No reports of significant flood damage to Collier County.

(6) ***"No-Name" (Subtropical Storm) - 1974*** - The development of this subtropical storm followed by several days the development of a tropical storm near Vera Cruz, Mexico. As the tropical depression weakened, a new center formed in the eastern Gulf of Mexico and moved rapidly northeastward to the Tampa Bay area. Sustained winds of 30-40 knots with gusts to 55 knots were reported in the Naples area. Tides of 2-4 feet above normal occurred from Everglades City to Tampa Bay. Total rainfall ranged from 20 inches near Tampa to 10 inches elsewhere. There were three drownings in Florida and damage was estimated at $10,000,000 in western Florida.

(7) ***Tropical Storm Dennis - 1981*** - made landfall near Cape Sable and exited the peninsula near Daytona Beach. No flood damage to Collier County. Maximum winds 35 knots.

(8) ***Hurricane Alberto (Cat 1) - 1982*** - was a near miss for Collier County. It formed off the Yucatan Peninsula and began moving

NE toward Collier County before turning west and dissipating. Only minor damage reported in Collier County.

(9) ***No-Name Storm (Subtropical storm) - 1982*** - developed in the Central Gulf of Mexico and passed substantially to our north making landfall near Cedar Key. There was a considerable amount of beach erosion along the coast from the Lee County line to Marco Island. There were no residential structures destroyed or substantially damaged. Several bulkheads and rock revetments experienced minor damage in Naples and Marco Island. Several man-made dune structures seaward of the Coastal Construction Control Line (Collier County) received minor damage at Vanderbilt Beach and Marco Island. Damage was estimated to be $100,000.

(10) ***Tropical Storm Bob - 1985*** - had maximum sustained winds of 40 knots as it made landfall near Lely Barefoot Beach in North Naples. There was widespread flooding throughout the area with rainfall amounts ranging from 7.7" at Naples, 11.6" at Marco Island, 14.5" at Everglades City, to over 22" at the Golden Gate Landfill. Although the sustained winds were only 40 knots, there were several gusts reaching hurricane limits. There were over 1,000 insurance claims filed, only 100 of them were for flood damages, the others were the result of wind and water damage. The Ritz Carlton was under construction at the time and most of the drywall had to be replaced.

(11) ***Tropical Storm Keith - 1988*** - formed south of Jamaica moved northwestward to the Yucatan Peninsula, before recurring to the northeast. It made landfall near Sarasota. In spite of the storm occurring at lunar high tide, there was little flood damage except to La Playa Inn on Vanderbilt Beach where 17 rooms, kitchen and dining room received some water damage. There was extensive erosion along the Naples beaches and the Naples Pier received about $500,000 in damages.

(12) ***Tropical Storm Marco - 1990*** - formed in the Florida Straits, south of Key West and moved north before reaching land at Cedar Key. Little damage was reported in Collier County even though the storm passed 43 miles to the west of Naples at time of astronomical high tide.

(13) ***Hurricane Andrew (Cat 5) - 1992*** - intensified into a major hurricane east of the Bahamas and made landfall near Homestead, Florida. The storm traversed the peninsula with the eye-wall remaining south of Everglades City and Marco Island

before recurving towards Louisiana. Some coastal flooding occurred after the storm passed to our east because of strong onshore winds and high tides. Storm surge values were generally between 6-7 feet NAVD along the south coast from Goodland to Chokoloskee Island.

(14) ***Tropical Storm Jerry - 1995*** - formed in the western Bahamas and moved northward entering the east coast of Florida north of Palm Beach. As it moved northwestward a feeder band remained nearly stationary over southwest Collier County for nearly 18 hours. Twenty-four hour rainfall amounts ranged from 17 inches in East Naples to 6-7 inches in Immokalee. Widespread flooding occurred in East Naples, the City of Naples and Golden Gate from this 100-year storm. Within two days of this extraordinary event, sheet flow flooding from Hendry County and north Collier County created serious flooding problems along the Lee and Collier line in Bonita Springs as well as increased floodwaters in Golden Gate Estates and Immokalee.

(15) ***Hurricane Opal - 1995*** - formed in the Bay of Campeche in late September. It moved northeastward and deepened into a Category 5 hurricane during the morning hours of October 4th and came ashore near Fort Walton Beach as a Category 3 during the early evening hours on October 4th. The associated feeder band, like T.S. Jerry two months prior, dumped several inches of rain on already super saturated areas of North Naples, Big Corkscrew Island and Immokalee. Sheet flow flooding remained over much of the area near Immokalee Rd (CR 846) until mid-November.

(16) ***Tropical Storm Gabrielle- Sept. 13-14, 2001***- Gabrielle formed a low-pressure system that developed along a decaying frontal system near Bradenton. As it moved southward, away from the peninsula, it developed Tropical storm characteristics. On Thursday afternoon at 5:00PM, the National Hurricane Center placed all of southwest Florida under a Hurricane Watch. At that time, Gabrielle was 150 miles west southwest of Naples. As it began meandering to the Northeast it intensified into a Tropical Storm with winds of 60 knots. The closest point of approach to Naples (70nm west) occurred on Friday morning at 5:00AM. Although rainfall exceeded 8 inches at several locations throughout the County, precipitation amounts at the Government Center were near 2 inches for the 24 hours preceding the storm.

The National Weather Service issued a Coastal Flood Watch for Collier County on Thursday afternoon. Water heights along the shore from the Lee County line to Chokoloskee Island were generally 3-5 ft above normal. It was estimated that approximately 50-60 residences and businesses experienced flooding and most of these structures were built prior to 1978 (pre-FIRM). Water depths in homes and businesses ranged from 1 inch to 18 inches. The timing of flooding conditions occurred on Friday morning from approximately 7:30AM in North Naples to 9:30AM in Everglades City. Waters began to recede after noon throughout the coastal area.

(17) ***Hurricanes of 2004*** – Hurricane Charley had the greatest direct impact on the residents of Collier County. Its effect on Collier County was that of an F-2 tornado since the hurricane wind field was so small. Only one to two feet of storm surge was reported, having no effect on the infrastructure. Personal property losses approximated $1.5M, mainly lanais. Debris costs to government were approximately $6.0M. No injuries were reported and the damaged area was around North Naples. The greatest general population impacts of the storm were: loss of power and shortage of fuel for vehicles. Hurricanes Frances and Jeanne affected the northeast portions of the county slightly due mainly to the fact that we were on the dry side of the hurricanes. One manufactured home in Immokalee sustained major damages from Hurricane Frances. No injuries were reported. No flooding problem was experienced in any of the three hurricanes.

(18) ***Hurricane Wilma – 15-25 October 2005*** - Wilma formed and became an extremely intense hurricane over the northwestern Caribbean Sea. It had the all-time lowest central pressure for an Atlantic basin hurricane, and it devastated the northeastern Yucatan Peninsula. Wilma also inflicted extensive damage over southern Florida. Maximum sustained winds were estimated to be near 105 kt (category 3 intensity) when landfall of the center occurred in southwestern Florida near Cape Romano around 1030 UTC 24 October. Greatest storm surge for Collier County was measured in Everglades City at 5.67 feet caused by the unusually fast forward speed. The hurricane, continuing to accelerate and now moving at a forward speed of 20 to 25 kt, crossed the southern Florida peninsula in 4.5 hours, with the center emerging into the Atlantic just southeast of Jupiter around 1500 UTC. Because the hurricane moved quickly across the southern Florida peninsula, however, the rain amounts were not very large in Florida and storm totals ranged generally from 3 to

7 inches. Wilma produces one tornado in Collier. That tornado resulted in the only direct fatality from the Hurricane. Overall, 10 more indirect fatalities resulted from Wilma, mostly due to cleanup efforts.

(19) ***Tropical Storm Debby – June 23-24, 2012*** - Debby originated from a broad area of low pressure that developed over the southern Gulf of Mexico during the third week of June. The low drifted slowly northward across the Gulf and finally strengthened to a tropical storm on the afternoon of June 23rd. At that time, the closest her wind-field was to Naples was 200 miles. That said, her biggest impact to Collier County was the three to three and a half foot of storm surge produced around Everglades City and three tornadoes, one of which affected East and North Naples communities. The storm surge produced resulted in about $110K in road, water pump damages as well as the associated labor and equipment costs of repair. This storm highlighted the fact that the storm does not have to be near you to be dangerous and costly.

(20) ***Tropical Storm Isaac – August 26-27, 2012:*** Isaac began as a tropical depression east of the Lesser Antilles on the morning of August 21, 2012, reaching tropical storm strength later that afternoon. Later, on Sunday, August 26th Isaac moved west-northwest through the Straits of Florida, with the center passing across the lower Keys late that afternoon. Isaac continued on a west-northwest track over the southeast Gulf of Mexico Sunday through Monday, August 27th. Rain reports for Collier County resulted in no impacts noted:

Location	Amount, in inches
Monroe Station – SFWMD	5.02
ESE Rock Island – SFWMD	4.49
Miccosukee Indian Res.	4.15
Oasis Ranger Sta.	3.85
N. Blocks – Golden Gate Est.	3.53 & 3.37
Bunker Hill – SFWMD	3.29
Quail Creek Est.	3.06

Wind and Inland Flooding Impacts: Minor.

Coastal Flooding Impact: Minor to Locally Moderate. An estimated 2-3 ft. storm surge impacted the coast during high tide Monday morning and midday, with the highest values from Marco Island to Everglades City and Chokoloskee. Inundation depths above ground ranged from less than a foot in Naples and Marco Island to as much as a few feet in Goodland and Everglades City. Water entered a few buildings in Goodland, but most flooding was confined to streets, marinas and yards. Less than 1,000 customers lost power. Collier experienced much coastal erosion to its beaches and Everglades City experienced damages to its roadways and the "grinders" associated with the sewage disposal systems for the homes.

(21) ***Hurricane Irma – 10 September 2017***: The following are excerpts from the **NWS Miami Tropical Winds Newsletter – Fall 2017**: "Hurricane Irma formed from an African Easterly Wave. It became a tropical storm on August 30th and a hurricane on the 31st in the eastern tropical Atlantic. On Sunday morning, September 10th, Irma strengthened to a Category 4 hurricane. The center of Irma then made landfall in Marco Island at 3:35pm that afternoon as a Category 3 with 115 mph winds.

Meteorological Information:

Wind: The highest wind gust recorded on land in South Florida was 142 mph at a mesonet site near Naples Airport. The highest sustained wind recorded was 112 mph by a spotter on Marco Island.

Storm Surge: In Collier County, inundation values were as high as 6-8 feet at Chokoloskee near the waterfront, with 3-5 feet across most of the island. At Everglades City, maximum of 6 feet of inundation occurred at Everglades National Park Gulf Visitor Center, with 2-4 feet across the town and as high as 5 feet in a few areas. Marco Island had 2-4 feet of inundation, mainly on the south and east parts of the island. Naples had 3-4 feet of inundation at the waterfront for areas within 1 block of the beach….

Rainfall: For most locations where most of the population lives in South Florida, rainfall amounts averaged 6 to 10 inches in association with Irma. However, the highest rainfall total was reported in Immokalee of 14.48". Other areas that had rainfall in the 10–14-inch range include portions of inland and central Collier.

Damage, casualty, impacts to South Florida:

Deaths: There were 33 indirect deaths in South Florida….
[NOTE: No direct deaths in Collier County]
Damage: In Collier County, at least 88 structures were destroyed and 1,500 others with major damage. Heavy tree and power pole damage occurred in areas affected by the eye wall, including Port of the Islands, Marco Island, Collier Seminole State Park, Golden Gate, Orangetree and parts of the city of Naples.
Monetary losses: Unincorporated Collier County (not including Naples, Marco Island and Everglades City) had $320 million in damage. Over 30,000 insurance claims were filed in Collier County….
Power Outages: As of Monday morning, 9/11, the day after the storm, there were 197,630 outages in Collier (94%) of all customers.

(22) ***Hurricane Ian – 28 September 2022***: Hurricane Ian made landfall in Southwest Florida at Cayo Costa in Lee County as a category 4 hurricane around 3 PM on September 28th, then moved northeast across the central Florida peninsula before moving off the east central Florida coast near Cape Canaveral on the morning of September 29th. A significant to devastating storm surge affected the Gulf of Mexico coasts of Charlotte, Lee, and Collier counties, penetrating a few miles inland across low-lying areas and along rivers and canals. In Collier County, extensive storm surge flooding occurred over most areas south and west of US 41/Tamiami Trail, as well as near the Gordon River, Cocohatchee River, and connecting creeks and canals. Hurricane force winds were observed in western sections of Collier, Hendry, and Glades counties near the southern and eastern eye wall of Ian. A total of 11 tornadoes were confirmed across South Florida in the northeastern quadrant of the hurricane, almost all of them in Southeast Florida from early afternoon on September 27th through the early morning of September 28th.

Collier's Storm Impacts
Evacuations: 32,500 (estimated)
Number of injuries unknown.
Significant to major storm surge flooding covered almost all of Collier County south/west of Tamiami Trail/US 41 from Everglades City to the Lee County line. Major storm surge flooding within a mile of the coast, both at the beachfront as well as the intracoastal waterways. Farther inland, significant to major storm surge flooding south and west of Naples Municipal

Airport along the Gordon River and Rock Creek, as well as along the Cocohatchee River and Palm River areas. Wind gusts of 100-110 mph were measured at about 100-150 feet above ground level over western Collier County, with peak near-surface wind gusts likely in the 80-90 mph range. Wind damage was mainly confined to trees/fences/screens, with minor wind damage to vulnerable structures. Estimated highest number of customers without power was 201,095 as of 3 PM on September 29th. Reported damage estimates for the entire county are $2.2 billion. Of that, $1.7 billion is to residential properties and $492 million to commercial. A total of 33 buildings were destroyed, with 3,515 residential and commercial buildings suffering major damage. Breakdown of damage amount by City/area: unincorporated Collier $948 million, city of Naples $989 million, Marco Island $256 million, Everglades City $7.1 million. Of The 5 reported deaths, 3 were from drowning by storm surge. Two occurred in the Sandpiper Street/Palm Street area south of Tamiami Trail about 1/3 to 1/2 mile east of Naples Bay. One occurred in the Moorings about 1/2 mile inland from the beach. Ages of the deceased Were 64, 73, and 73 years, respectively. The other 2 reported deaths were related to heart disease with contributing stress from the storm.
(Event Summary from NWS Miami's **Post Tropical Cyclone Report**)

Fatalities in Collier County – 5

Highest Land Winds (mph) in Collier County
(NOTE: It is unlikely that the point-based observations provided in this report sampled the peak values for the event.)

Station	Sustained	Gust
Naples Grand Beach Resort	66	112
Kalea Bay – Vanderbilt Beach	66	106
Naples Airport Tower	67	105
East Naples	58	89
Immokalee	52	81

Collier EOC's peak wind speed at 3pm, 28 Sept., was 64mph

Rainfall total from 8:00am Sept. 26 to 8:00am Sept. 29

Location	Rainfall (in)
Belle Mead	8.16
NNE East Naples	6.99
SSW Orange Tree	6.27
ESE Sunniland	6.19
ESE Ochopee	5.13

NW Miles City	5.06
Oasis Ranger Station	4.26
ENE Marco Island	3.98

Storm Surge/Tide Information

Location	**Storm Surge/Tide**
Barefoot Beach areas/N end of County	10-11 ft*
S end, Gordon Pass to Naples Pier	7-9 ft*
Vanderbilt Beach to Wiggins Pass	8-10ft*
Palm River Estates	6-8 ft*
Naples Bay, Tin City, Cove Inn areas	4-7 ft*
E side of Naples Bay in Royal Harbor area	4-7 ft*
Naples Airport/Rock Creek/Baker Park	4-6 ft*
Tamiami Trl near Bayshore Dr intersection, E. Naples, from Tamiami Trl N to Davis to Rock Creek	2-3 ft**
Naples/River Park/Central Ave	3-4 ft**
Marco Island (MI)	7 ft*
MI, inundation in lower elevations	2-4 ft**
Goodland at Stan's Hideaway	4 ft**
Stan's Hideaway to Goodland Bay	7 ft*
Everglades City (common across town)	2-4 ft**
(NOTE: Storm surge made it as far inland as Tamiami Trl from Ochopee to SR 92)	
Chokoloskee, at Outdoor Resorts Hotel	6 ft*

* **Mean Higher High Water (MHHW)**. The average of the higher high-water height of each tidal day observed over the National Tidal Datum Epoch.
**** Above Ground Level** (AGL)

3. **Non-hurricane/Tropical Storm Flooding.** Collier County is vulnerable to flooding from canal overflow and ponding.

   a. Flooding from canal overflow is almost always caused by heavy rains within a drainage area and the subsequent inability of a canal to accommodate the additional runoff. Canal overflow would occur following an extended period of rainfall causing most bodies of water within the County to overflow their banks. Collier County is not affected by rainfall falling outside of the County other than for south and east Lee County and western Hendry County. If this were to occur, some highways in the County may be inundated as well as several residential areas in close proximity to canals (Golden Gate City and Estates, Coconut River and those near the Cocohatchee and Gordon Rivers as well as the Henderson Creek area).

b. Ponding occurs in low-lying areas that are characterized by poorly drained or super-saturated soils (high water table). This type of flooding in Collier County occurs throughout the County where elevations above sea level are low and/or the water table is high.

c. Fresh water flooding occurred in late June 1992 in North Naples in areas that were not designated as being within the 100-year flood plain. Several homes reported flood damage in the 700 and 800 blocks of Naples Park between 93rd Ave. North and 108th Ave. North. Additional flooding occurred in the northeastern portion of Imperial Golf Estates. (A major capital improvement project was done in Naples Park in 1996-97 to prevent a recurrence. This work included the installation of a major stormwater culvert and swale system designed to accommodate the runoff from a 10-year storm event.)

d. ***Summer's Flood Event #1:*** On September 29, 2003, a cold front stalled over central Florida as a tropical disturbance moved from the southwest Caribbean Sea into the Southern Gulf of Mexico. This set up a southwest flow over southern Florida and allowed for deep tropical moisture to move into south Florida from the Caribbean and southern Gulf of Mexico. Rainfall amounts between 4 inches to 8 inches fell across Collier County. But western Collier County got the heaviest of the rainfall with locally 8 to 10 inches. Marco Island received 8.10 inches of rainfall, Bonita Springs received 5.00 inches of rainfall, and Naples set an all-time daily rainfall record of 6.93 inches. By early afternoon, Collier County Emergency Management Officials were asking everyone in western Collier County to stay off the roads if they did not absolutely have to travel as canals were swelling and spilling over their banks, several roads were closed, and houses were starting to flood. There were also reports of people surfing in the streets in the Naples region of western Collier County. By evening, most of the rainfall had ended over Collier County, but it took until late Tuesday (September 30, 2003) to get the streets and back yards of houses to dry out. (Baxter, National Weather Service, Miami Florida). Although the high tides at the time of the rain event exacerbated the flooding, the effects were mainly flooded streets and sheet flow/ponding around the area. However, there were no reports of flooding in homes there were several motorists stranded for up to an hour in stalled vehicles. Regarding septic systems, the Dept. of Health said they didn't get many calls and the ones with problems were the older septic design system, not the "mound-type" system.

e. ***Tropical Storm Ernesto & Subsequent High Rainfall (August-September 2006):*** Tropical Storm Ernesto passed through southwest Florida on August 30, 2006. Although the storm did not bring any damaging wind, the amount of rainfall associated with and following the storm was very severe in parts of Collier County. In west central Collier

County, the area lying east of County Road (CR) 951, west of State Road (SR) 29 and south of CR 846 received the brunt of rainfall. Nuisance flooding in low lying areas and inundation of roads in several parts of Northern Golden Gate Estates (NGGE) brought inconvenience to the residents of those areas. Hydrologic conditions of the central Collier County region had been wetter than normal prior to the storm. Beginning from July, the regional groundwater level started to rise above the long-term average levels, and this trend continued to the end of the August. Such soggy antecedent moisture and saturated groundwater conditions could not absorb the high intensity rainfall and generated significant runoff with flash flooding and street inundation in several low-lying areas of NGGE and adjacent outlying areas. Of particular note is the Rock Road – Acremaker Road area between Richards Road and Moulder Drive, south of CR 846, where the residents were inconvenienced for several days due to inundation of roads and yards. During the period August 1 to September 25, between 22.0 to 32.5 inches of rain fell generally in the GGE area. No homes were known to become flooded during this rain event.

f. ***October 2011 – 6th Wettest October on record:*** A total of three heavy rain events took place over southern Florida in October, contributing to a very wet October area-wide. Average rainfall for this month was 10.16" (Historical October average is 3.50"). It should be noted that during this month, damages due to some road and yard inundations were minimal and no homes were flooded. During the last weekend of October (Friday – Monday) the following rainfall totals were recorded in Collier County:

- Marco Island – 7.03"
- Isles of Capri – 6.74"
- Ave Maria – 6.12"
- North Naples – 6.03"
- Belle Meade – 5.96"
- Golden Gate Estates – 5.93"
- Immokalee – 4.69"
- East Naples – 4.56"

g. ***September 6 - 8, 2013 – (Record rainfall in Naples was 6 September***): Thunderstorms with torrential rainfall develop just inland of the Collier County coast during the late afternoon and early evening hours of Friday, Sept. 6th and moved west across northern portions of the Naples metro area. The communities of Golden Gate, Golden Gate Estates and North Naples were particularly affected, with North Naples being hardest hit. The atmosphere was quite unstable during the day of the 6th, but thunderstorm activity was delayed by the presence of slightly drier air aloft. However, by early evening a southward-moving gust front from earlier storms in North Florida made it to the Collier County region and interacted with the Gulf sea breeze which was located over the interior

sections of the area. This convergence of the two air masses led to rapid development of the thunderstorms with torrential rainfall and near-continuous lightning. Isolated storms initially formed in the Golden Gate area between 630 and 7 PM, with a large cluster of storms organizing over the Everglades between 7 and 730 PM. Two thunderstorm cells developed in the North Naples area around 745 PM, with the main area of storms still to the east over the Everglades. Between 815 and 830 PM, the large area of storms over the Everglades converged with the cells over North Naples and 845 PM the entire area of storms expanded and intensified to cover the entire area from Vanderbilt Beach across to Golden Gate Estates, with a second area of intense storms in the East Naples area. The cluster of storms in the northern part of the county remained nearly stationary through 930 PM as it dumped excessive amounts of rainfall. It is during the time between 830 PM and 10 PM when the highest rainfall rates took place. Rains began to taper off after 10 PM but remained in the light to moderate range until shortly after midnight. Rainfall amounts in the North Naples/Naples Park/Palm River area ending at 8 AM on Saturday the 7th were between 5-10 inches, with a highest measured value of 9.45 inches near the intersection of Logan Blvd North and Immokalee Road (near Gulf Coast High School). Farther south, rainfall amounts in the 3-5 inch range were measured in the city of Naples, Golden Gate, Golden Gate Estates and East Naples areas. Extensive flooding was reported in the North Naples area with many streets closed due to high water. Damages and impacts: two house fires from lightning, three water main breaks, one tree down across a roadway, and dozens of flooded roadways with people stranded in stalled cars.

h. ***August 4, 2014 – (Record rainfall again set for Naples):*** A band of thunderstorms with very heavy rain set up from the Gulf of Mexico across western Collier County in association with a low-pressure area over North Florida. The band moved little between 1230 PM and 3 PM as the individual storms moved east over the city of Naples. This "training-effect" of the heavy rain cells led to copious rain amounts and severe street flooding in parts of Naples and Golden Gate. Automobiles experienced the greatest amount of the damages. Some businesses experienced minor water intrusion. The flooding threat left the area about 7:30 pm Monday night**.**

Highest Measured Rainfall Amounts (source):
•Naples Beach Hotel and Club: (CoCoRaHS): 7.00"
•Naples Municipal Airport (NWS): 6.73" *
•Gulfview Middle School (AWS): 6.25"
•Golden Gate (CoCoRaHS): 5.89"
(* Sets new daily record for August 4th as well as for any day in August.)
•Measured rainfall of 4 inches in one hour (between 1 and 2 PM) **is equivalent to a 50 to 100-year rainfall for Naples.**

B. Physical Characteristics

Collier County is located on the southwest coast of Florida. Lee and Hendry Counties border it on the north, on the east by Miami-Dade and Broward, on the south by Monroe County and on the west by the Gulf of Mexico.

1. It has approximately 2,000 square miles of land area of which approximately 60 miles front on the Gulf of Mexico.

2. The topography of the land is basically flat ranging from 2-5 feet along the coast to 35-40 in the northeast section of the county near Immokalee.

3. There are no major rivers within the county. Most natural open water streams are south of US41 into the Ten Thousand Islands. The Gordon River enters into Naples Bay and extends northward to the vicinity of the Naples Airport. The Cocohatchee River in North Naples enters into the Gulf of Mexico via Wiggins Pass. The headwaters of each river are south and west of I-75. Water areas are generally comprised of man-made lakes, canals, and water retention areas with only a few natural lakes.

4. The average elevation of the County is approximately 10-11 feet. However, the average elevation of the highly developed areas of the urban area is 7-8 feet.

5. Poor drainage conditions exist in the western and southern areas of the County where the water table is high. During periods of heavy rain over extended periods of time, most natural and man-made bodies of water may overflow resulting in flooding. If this were to occur, several highways in the County (US41, SR92, Golden Gate Parkway, Everglades Boulevard) could be inundated as well as roads in several residential areas. (See Attachment 1 to this Annex).

C. Land Use Patterns

1. There are twelve planning community areas within the unincorporated area of the County. The Naples urban area is bounded by the Gulf of Mexico to the west and south, CR846 to the north, and CR/SR951 to the east.

   The urban area consists of 7 of the 12 planning communities. Commercial areas are found along US41 from CR951 to the Lee County line, CR951 and Golden Gate Parkway in Golden Gate, Airport Road south of Golden Gate Parkway, North Collier Blvd. on Marco Island, and Main Street in Immokalee.

   The remainder of the urban area consists of single and multi-family residential areas. The Rural Estates Planning Community and the western portion of the Royal Fakapalm are primarily agricultural as are portions of the Corkscrew Planning Committee. Big Cypress is primarily undeveloped, protected wetlands.

2. Intensity of development within the County urban area is low, ranging from 3-6 dwelling units per acre. The only exceptions to this are Park Shore, Pelican Bay,

Vanderbilt, and Marco Island beachfront property where density is 12-16 units per acre.

D. Demographics (See Basic Plan, Figures 2 & 3)

III. Concept of Operations

A. Flood Threat Recognition comes to the Emergency Management Division via several sources:

1. Through the National Weather Service Office via its products: Flash Flood Warning and Flood Warning. The difference between "Flash Flood" and "Flood" is that the first is for flooding which occurs within 6 hours of the causative event (rain), while the second is for residual flooding greater than 6 hours after the end of the rain. The Flash Flood is much more common than the Flood, but we can get the second type especially in the days after a very wet tropical system in which a "sheet flow" can come down from Hendry County and flood inland sections of the county. The last time this was witnessed was in 2008 after TS Fay.

2. South Florida Water Management District's Big Cypress Basin - To provide more efficient flood protection services to residents, Big Cypress Basin staff worked with modeling, scientific data and information systems staff together developed a real-time flood modeling and decision-making support system for operation of the water control gates. The project uses the Basin's real-time meteorological and hydrologic data for surface and groundwater levels and gate positions to model and forecast both surface water and groundwater stages and provide flood warning and real-time decision-making information to the field staff to operate the control gates accordingly. The information on real-time surface and ground water levels, flows, rainfall, gate positions and forecasted water levels are available through the following URL: https://apps.sfwmd.gov/sitestatus/#/bcb then select system of interest within Collier County

3. Florida Division of Emergency Management (FDEM), the State Watch Office (SWO): FDEM has a staff meteorologist who could also be made available to the county and/or who also would issue flood –threat advisories to affected counties.

B. This program is based on the principle that the County bears the initial responsibility for warning the public of a threat, disaster response and disaster recovery operations. As a corollary to this principal, each level within local government will accomplish the functions for which it is responsible, requesting relief from the next higher level of government only after resources at that level are inadequate to respond to the flood emergency or disaster. Requests for assistance will be made to the Florida Division of Emergency Management only after the Board of County Commissioners has declared a State of Local Emergency.

C. The Emergency Management Director may activate portions of this plan, if a flood disaster/emergency threatens, prior to the Board of County Commissioner's decision to declaration a State of Local Emergency. In this situation, the Emergency Management Division will coordinate increased readiness procedures and such emergency response

actions as might be necessary for the immediate protection of life and property.

D. When State and local resources are determined to be inadequate to the flood emergency, the Governor will request assistance through the Federal Emergency Management Agency. The request will be based on local and state damage assessments and expenditure reports that are to be maintained and supplied by the County and/or State for each flood disaster related activity.

E. When conditions are favorable for flooding from either storm surge flooding or from freshwater flooding from abnormally high amount of precipitation over a short period of time, the following actions will be taken by the agencies listed below:

Agency **Action Responsibility**

SFWMD's Big Cypress Office

1. Monitor and/or run the Real-time Hydrologic Monitoring & Modeling system.
2. Keep the EOC informed of flooding threats and trends as they occur.
3. Maintain the automated "Floodwatch System" and to keep the Emergency Management Division informed of changes to it or on-call personnel changes.

Emergency Management (ESF-5)

1. To staff the Emergency Operations Center as the situation dictates.

2. Maintain the emergency contact name/number listing for those responsible for day-to-day operation of critical facilities/activities and the 911 address of the facility.

3. To notify all primary respondents as the situation dictates.

4. To advise the public of the situation through local radio and TV announcements.

5. To keep the Division of Emergency Management and other state agencies and adjacent counties informed of the situation.

6. Establish/maintain communications and warning capabilities with Collier County's Critical Facilities.

7. When emergency management receives a "Floodwatch" message about possible flooding conditions developing from the Big Cypress Basin's Water Management District (BCBWMD) Office, EM will contact the on-call BCBWMD representative to determine the potential impact of the alert. If flooding conditions threaten people or properties, EM will initiate immediate coordination calls with the affected fire district, the Sheriff's

office, the Collier County Public Information Officer, Transportation Management Services Department's Road Maintenance Division, Collier Public School District and/or the American Red Cross.

8. When registered Special Needs people are in the affected area, Emergency Management will initiate activities to protect that/those personnel, e.g., evacuation, sheltering, etc.

9. Based on anticipated weather conditions and the degree of soil saturation, adjust thresholds to the EarthNetworks weather streamer warning system to automatically send out information about the hazardous weather criteria being met.

10. Maintain the shelter Disaster Resource Units (DRU) for rapid deployment should they not already be on site. Appendix 3 to this annex identifies the basic items maintained in each DRU.

11. Conduct an annual Hurricane/Flood Exercise per CRS participation requirement.

Collier Public Schools (ESF-6)

To provide shelter and bus transportation upon request from the Emergency Operations Center.

American Red Cross (ESF-6)

To provide damage assessment information.

1. To provide manpower and supplies for opening and operation of shelters and to coordinate with Emergency Management Division regarding the timing of such openings consistent with the dangers facing the people who will occupy the shelter.
2. To provide Mobile Feeding.
3. To provide immediate human needs relief, e.g., shelter, food, clothing etc.

Collier County Sheriff's Office (ESF-16)

1. To provide traffic control and security for those in the flood threatened area and shelter security.
2. Activate the IPAWS (Integrated Public Alerting & Warning System) when an imminent life or property threatening flooding situation exists.
3. Provide a door-to-door emergency notification SOP for flood and wildfire events.

Fire/Rescue Districts (ESF-4)

1. To provide fire control and suppression throughout the County.
2. To provide rescue service as needed.
3. To provide fire safety control at each shelter.
4. To alert and coordinate Community Emergency Response Team (CERT) responses.

Collier County EMS (ESF-8)

1. To provide ambulance/rescue service.
2. To provide first-aid support at each shelter.

Transportation Services Dept. (ESF-3)

The ESF-3 (Public Works & Engineering) is organized utilizing personnel from both the Transportation Services and Public Utilities Departments depending on their respective areas of responsibility and expertise, as outlined below.

1. Capital Project Planning, Impact Fees & Program Management Division (Impact Fees, Stormwater, Transportation Planning, Coastal Zone Management, Pollution Control and Prevention & Waterway Debris)
2. Operations Support Division (County Airports, Media Relations, Budget)
3. Road Maintenance Division (Road Maintenance & Inspection, Landscape, Survey) (See Attachment 4 for Equipment Listing)
4. Transportation Engineering Division (Roads & Bridges, Right of Way, Traffic Lighting and Signals)

Growth Management Community Development Department

1. Development Services Division (Regulatory Management, Development Review, Building, Zoning and Code Enforcement – Damage Assessment & Disaster Temporary Housing

Public Utilities Dept. (ESF-3) - The ESF-3 (Public Works & Engineering) is organized utilizing personnel from both the Growth Management and Public Utilities Departments depending on their respective areas of responsibility and expertise, as outlined below.

1. Engineering and Project Management Division
2. Water Division (Water Plants, Compliance, Power Systems, Well Field and Water Distribution)
3. Wastewater Division (Water Reclamation Plants, Powers Systems, Irrigation Quality System, and Collections including over 800 lift stations)

4. Solid and Hazardous Waste Division (non-waterway debris removal, garbage collection, household hazardous waste collection and landfill oversight)

Florida Department of Health - Collier (ESF-8)

To provide health and environmental health services, including potable water well inspections after a flooding event.

ESF-2 (Communications) To provide emergency communications support between the E.O.C., hospitals, and public shelters.

Salvation Army (ESF-6) To provide mobile feeding sites.

F. Meteorological information will be obtained from the Tropical Prediction Center for all flood threats resulting from tropical storms and hurricanes. Miami Weather (NWS), co-located with the Tropical Prediction Center, will issue flood advisories that may affect Collier County. Either weather agency may contact the Collier Emergency Management Division via telephone or ESATCOM. Additionally, the EOC obtains meteorological information and images via satellite and private meteorological services. Information may also be transmitted by the same communication method from Miami Weather Forecast Office to the EOC.

1. Hurricanes and their related storm surge and precipitation amounts provide the greatest flood threat to citizens of the County. Therefore, all tropical advisories will be monitored and plotted on the hurricane-tracking chart in the EOC and disseminated to the public via Collier County government web pages and through public safety announcements.

2. The Tropical Prediction Center (TPC) issues advisories at least at six-hour intervals during the progress of all tropical depressions, storms, and hurricanes. The NHC also issues tropical and hurricane "Watch" or "Warnings" for specified coastal areas.

   a. When a watch or warning has been issued for Southwest Florida, the Emergency Management Director will assess the situation and if appropriate, call a briefing session with all concerned agencies.

   b. The Public Information Officer (PIO) in coordination with the Board of County Commissioners and Emergency Management Division will begin issuing news advisories.

   c. Depending on the situation, all advisories received from Miami Weather and the Tropical Prediction Center will be retransmitted via electronic means to all public safety and media outlets that service Collier County. These advisories should be aired immediately.

   d. Announcement of pertinent information in the Collier County "All Hazards Guide" and social media book will be brought to the public's

attention. These spot announcements to the various media sources will attempt to reinforce the ongoing educational effort during the year.

e. The Emergency Management Director provides information to the public upon demand. The department provides scores of hurricane seminars per year. In each seminar, storm surge vulnerability is stressed, along with flood insurance requirements and methods to mitigate against any damage from flooding. In these talks to the community, information on evacuation routes and shelters is also made available. The Growth Management Department (Floodplain Management Section) provides annual outreach engagements to schools, civic and religious groups, fraternal organizations, homeowner associations, realtors etc. The six CRS priority topics are covered in these outreach events. The Floodplain Management Section also sends out a Flood Protection Newsletter to property owners whose properties are in the Special Flood Hazard Area. Contained in that newsletter are details on how to stay informed on weather conditions and evacuation processes for a flood event.

f. During periods of Emergency Operation Center activations, WGCU-FM (local EAS station) and local Government Access cable television (Channel 97) may broadcast directly from the EOC and/or get emergency public information directly from the EOC. All other media sources will be fed information from the EOC to the adjoining media room and via facsimile to the various media outlets within the County.

3. Since the main flood threat to the lives of Collier County residents is from tropical cyclones, every effort will be made to educate the public concerning this threat. Meetings with schools, civic and religious groups, fraternal organizations, homeowner associations, realtors etc. will accomplish this formal education process. Additional tips will be provided via radio "spots", posted through the Emergency Management Division's Home Page (www.CollierEM.org) and helpful hints to the daily and/or weekly papers. In all of their presentations, the following items will be stressed:

   a. Areas which are particularly vulnerable to flooding from riverine flooding or storm surge. "Know Your Risk"

   b. The use of pre-disaster checklists

   c. Flood and home-owners insurance

   d. Preparedness tips to minimize disaster related losses

   e. Shelter locations and evacuation routes

   f. Recovery information

   g. Point of contact for additional information

h. Flood Insurance Information

i. Description of methods of which residents will be warned of the threat

F. Requests for State Assistance must be forwarded to the State Emergency Operations Center for assessment and approval before deployment of State resources. Prior to requesting State Assistance, the current situation must be identified, the current and projected resource needs must be assessed, and a time frame, indicating how long the State's resources would be needed, must be identified.

IV. Execution

This Annex to the Comprehensive Emergency Management Plan addresses the Collier County Flood Warning Program through the following elements: Public Information, Flood Threat Recognition Phase, Emergency Warning Dissemination and Other Response Efforts.

A. Public Information

Increasing the public's awareness of flood hazards and the methods they can use for protecting themselves from the effects of these hazards is a necessary part of reducing disaster potential, preparing for disasters as well as a continuing responsibility of public officials. In addition, providing accurate information immediately before, during and after a flood emergency or disaster is very important for saving lives, minimizing property damage, and informing people of various assistance programs. This Annex describes the organization and procedures for providing accurate information to the public.

1. Responsibilities:

   The Emergency Management Division is responsible for coordinating public information programs and related activities about flood emergencies or disasters. This responsibility includes public awareness programs in schools, civic and fraternal organizations, community subdivisions and other organized groups including radio and television when requested.

2. The Public Information Network, comprised of members of the following agencies, will meet periodically before, during and after a flood emergency to minimize conflicting information being disseminated. Members of the network who have assigned public relations tasks include but are not limited to the following:

   a. Board of County Commissioners

   b. County Manager or his representative

   c. Emergency Management Director

   d. Stormwater Management Director

   e. SFWMD - Big Cypress Basin Director

f. Superintendent of Schools or representative

g. Red Cross Disaster Chair

h. Transportation Services Department Administrator

i. Sheriff or representative

j. President, Collier Fire and EMS Chiefs' Association

k. Communications, Government & Public Affairs Division Director

l. Municipalities

3. An "All Hazards Guide" is updated and reprinted as necessary for distribution to residents and visitors of Collier County. Every effort is made to deliver this information to people living in flood-prone areas. Disaster related information is also provided to residents and visitors local telephone book publication and social media.

4. Special information programs have been established for people with special needs such as the elderly and the handicapped. These individuals are encouraged to pre-register with the Emergency Management Division who will advise them of their vulnerability to flooding and items that they should bring to a shelter in the event of an evacuation. The Emergency Management Division will also arrange for transportation to shelter if needed.

5. During an emergency/disaster that might result in flooding over parts of the community, a team of telephone operators will be assembled near the EOC to provide information to the public. At least one of the operators will be bilingual (English Spanish).

B. Flood Threat Recognition Phase

As previously mentions, we have several main sources for flood threat recognition within Collier. Those are: National Weather Service Office in Miami, SFWMD's Big Cypress Basin's office in Naples and the FDEM State Watch Office in Tallahassee. This phase may have several pre-disposing conditions whereby any or all of those conditions being absent may not warrant a flood threat concern. The following conditions, compounded, increase the flood threat concern and result in the associated Emergency Operations Center activation level.

1. Saturated grounds due to prolonged rainy periods whereby absorption into the soil is hindered or a period of three to five inches of rain has fallen within 48 hours and more rain is anticipated. (See Attachment 1, Areas Prone to Rainfall Ponding)

2. High tides occurring during the heaviest rainy periods.

3. A series of rain clouds producing a "training effect" over an area.

C. Level Three, Monitoring Phase

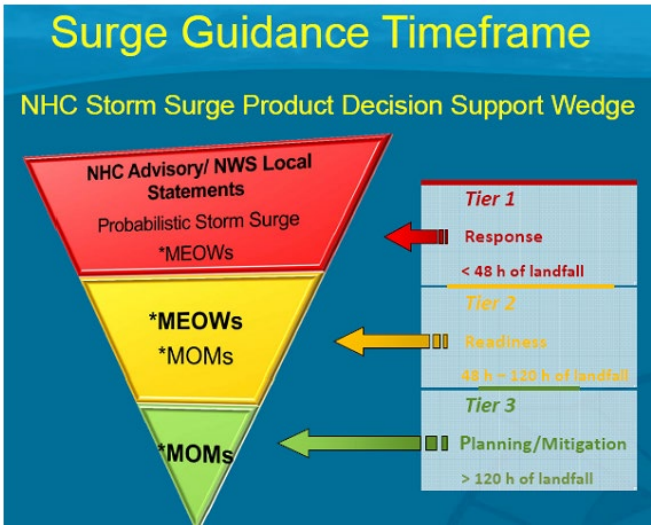
1. Emergency Management will:

   a. Daily, review the day's short-term forecast at the Miami Weather Forecast Office's home page, review automatic and web-based monitoring, telemetry systems, and repost the daily weather graphic (http://www.weather.gov/mfl/) on the Collier County Emergency Management home page and monitor the flooding potential. If a flood threat presents itself, disseminate the information to those most affected via means identified in the Basic Plan [e.g., NOAA Weather Radio (EAS), Emergency E-Mail, Blast fax lists for government entities and vulnerable areas such as mobile home parks, etc.]

   b. Collaborate with both the National Weather Service Office in Miami, SFWMD's Big Cypress Basin office and the State Warning Point on any significant flooding event potential. When a potential major flooding type event threatens, both the Miami Weather Service Forecast Office and the Big Cypress Basin of South Florida Water Management District (SFWMD) will most likely institute once a day webinar and/or conference calls with the threatened counties. (NOTE: Both the Miami Weather and the SFWMD offices will provide the best area rainfall forecasts as well as the best real-time rainfall rates for each weather event. They both have access to, and/or possess, rainfall and waterway gauges to monitor real-time water impacts.) Using GIS-type mapping products depicting areas susceptible to past flooding events, alert response agencies based on the weather forecasts.

   c. Activate the Collier Storm Spotter/SKYWARN network either based on the daily Hazardous Weather Outlook product of the National Weather Service or when weather situations deteriorate. Initiate conference calls with the various fire districts, as needed.

   d. **STORM SURGE**: Regarding the flood threats from storm surge, the graphic below depicts the timeline and the modeling tools from the National Hurricane Center (NHC) that the local emergency management office uses to estimate and refine potential storm surge impacts. (For more information about storm surge, go to: https://www.nhc.noaa.gov/surge/). Then as the NHC makes computer graphic associated with a particular storm and posts it on their hurricane web page. Ultimately, within, 24 hours of a landfall, the local Miami Weather Forecast Office will provide the most precise surge impacts to the local jurisdiction in the form of probability statements and graphics.



2. Transportation Services Department's Road Maintenance Division will maintain 24/7 capability to respond to public regarding roadway concerns.

D. Emergency Warning Dissemination

During this phase the National Weather Service Office, Miami has issued a "Flood Watch" and the conditions cited above are the most unfavorable for the grounds absorbing a heavy rainfall amount and therefore roadway flooding, etc., will present hazardous/adverse conditions to the public.

1. Level Two, Partial EOC Activation

a. Emergency Management will:

1) Continue with all activities in the Threat Recognition Stage.

2) Critical Facilities: The Collier County Emergency Management Division maintains a listing of Critical Facilities which could be affected by flooding in the County. This listing is considered sensitive and is protected under HSPD 5 and is available For Official Use Only. The list includes the following:

- Names of key personnel
- Personnel contact info
- Physical location of facility
- Alternate communication systems
- Copy of flood/evacuation plan

In the event of a flooding risk to one or more of these facilities, they will be notified as soon as possible in advance of the risk in accordance with the emergency notification protocols outlined in the CEMP and Emergency Management Division SOGs. Due to the critical nature of the function or service provided by these facilities, every attempt will be made to give as much advanced

warning as possible so that preventative measures can be taken to protect the facilities and people.

3) Provide regular updates via E-mail/Web Page to staff and the local governmental agencies and Critical Facilities.

4) Assemble complete EOC staff and brief at the initial stages of Level 2 Activation, depending on the anticipated severity of the event.

5) Consider activating the Collier Emergency Information Hotline.

6) Monitor the flooding event and disseminate details of the impacts via all means identified in the "Basic Plan".

7) Continue to collaborate with both the National Weather Service Office in Miami, SFWMD's Big Cypress Basin office and the State Watch Office on the flooding event potential and adjacent counties.

8) Activate the SKYWARN Weather Spotter Network to report rainfall impacts.

9) Pre-identify and coordinate shelter openings, as required.

10) Initiate actions for a Local State of Emergency, if warranted.

b. Municipal liaisons will be requested to monitor the event's impact on their jurisdiction from the EOC.

c. Collier Schools will be asked to remain at the EOC while school delay/closing decisions are anticipated/made.

d. Collier Fire Chiefs will alert their CERTs regarding impact reporting and first responder assistance requirements.

e. American Red Cross will:

1) Open shelters as requested.

2) Provide humanitarian services, as necessary.

3) Provide a liaison to the EOC, as requested.

4) Keep the Emergency Management office advised on the findings from the Damage Assessment.

f. Collier Sheriff will:

1) Provide liaison to EOC when requested.

2) Coordinate traffic activities.

g. Transportation Services Department will:

1) Provide a liaison to the EOC to maintain an accurate, current listing of affected roadways & stormwater facilities.

2) Blockade flooded roadways as necessary and provide appropriate signage.

3) Submit projects and mitigation initiatives to the Local Mitigation Strategy Working Group when called.

4) Provide sandbags and sand bagging capability on a situational basis to flood circumstances which can be mitigated effectively by that type of mitigation (to be approved by the EOC and in accordance with the GMD protocols outlined in their "Sandbagging" SOP.

h. Growth Management Community Development Department will:

1) Take reports from the public regarding flooding (252-8924/25) and maintain flooding records.

2) Provide post-event damage assessment.

2. Level Three, Full EOC Activation

a. Emergency Management will:

1) Continue with all activities in the Threat Recognition Stage.

2) Critical Facilities: The Collier County Emergency Management Division maintains a listing of Critical Facilities which could be affected by flooding in the County. This listing is considered sensitive and is protected under HSPD 5 and is available For Official Use Only. The list includes the following:

- Names of key personnel
- Personnel contact info
- Physical location of facility
- Alternate communication systems
- Copy of flood/evacuation plan

In the event of a flooding risk to one or more of these facilities, they will be notified as soon as possible in advance of the risk in accordance with the emergency notification protocols outlined in the CEMP and Emergency Management Division SOGs. Due to the critical nature of the function or service provided by these facilities, every attempt will be made to give as much advanced warning as possible so that preventative measures can be taken to protect the facilities and people.

3) Provide regular updates via E-mail/Web Page to staff and the local governmental agencies and Critical Facilities.

4) Assemble complete EOC staff and brief at the initial stages of Level Three Activation, depending on the anticipated severity of the event.

5) Consider activating the Collier Emergency Information Hotline.

6) Monitor the flooding event and disseminate details of the impacts via all means identified in the "Basic Plan".

7) Continue to collaborate with both the National Weather Service Office in Miami, SFWMD's Big Cypress Basin office and the State Watch Office on the flooding event potential and adjacent counties.

8) Activate the SKYWARN Weather Spotter Network to report rainfall impacts.

9) Pre-identify and coordinate shelter openings, as required.

10) Initiate actions for a Local State of Emergency, if warranted.

b. Municipal liaisons will be requested to monitor the event's impact on their jurisdiction from the EOC.

c. Collier Schools will be asked to remain at the EOC while school delay/closing decisions are anticipated/made.

d. Collier Fire Chiefs will alert their CERTs regarding impact reporting and first responder assistance requirements.

e. American Red Cross will:

1) Open shelters as requested.

2) Provide humanitarian services, as necessary.

3) Provide a liaison to the EOC, as requested.

4) Keep the Emergency Management office advised on the findings from the Damage Assessment.

f. Collier Sheriff will:

1) Provide liaison to EOC when requested.

2) Coordinate traffic activities.

g. Transportation Services Department will:

1) Provide a liaison to the EOC to maintain an accurate, current listing of affected roadways & stormwater facilities.

2) Blockade flooded roadways as necessary and provide appropriate signage.

3) Submit projects and mitigation initiatives to the Local Mitigation Strategy Working Group when called.

4) Provide sandbags and sand bagging capability on a situational basis to flood circumstances which can be mitigated effectively by that type of mitigation (to be approved by the EOC and in accordance with the GMD protocols outlined in their "Sandbagging" SOP.

h. Growth Management Community Development Department will:

1) Take reports from the public regarding flooding (252-8924/25) and maintain flooding records.

2) Provide post-event damage assessment.

E. Other Response Elements

1. SKYWARN Spotter Network: In support of the National Weather Service Office, Miami, Collier County conducts hazardous weather spotter training to residents annually, or upon special request of the Emergency Management Office. Currently, there are over 150 trained spotters. The spotters receive regular weather information updates from the EOC, via E-mail, and through the other media.

2. Emergency Alerting System: The EOC has drafted an operating procedure, agreed upon by the NWS, Miami, for activating the Emergency Alerting System and thereby transmits warning and instructions via the weather radio, TV, radio, and cable media. Not only is the public alerted, so are the specialized teams, e.g., SKYWARN and CERTs.

V. Administration

A. Records Preservation and Restoration

1. All County Agencies must ensure the protection of vital records so that normal activities may continue after the disaster. These records may also be necessary for the rapid recovery from the effects of a flood disaster.

2. Damage to records is most often the result of fire and water damage. These records can often be saved by prompt salvage action. Technical guidance for

records preservation can be obtained from the Emergency Management Division or the State Division of Emergency Management.

B. Funding and Accounting

1. Collier County may allocate and expend funds as appropriate for local emergency operations. Depending on the onset of hazardous weather conditions, either of the following mechanisms may be implemented:

   a. Local Accounting

      Complete accurate accounts of emergency expenditures and obligations, including personnel and equipment costs, must be maintained. Despite the difficulty in maintaining such records in the stress of an emergency, accurate accounting is required to identify and document:

      1) Funds for which Federal reimbursement will be requested should a Presidential Declaration be made and,

      2) Those funds eligible for reimbursement under emergency or major disaster project applications.

   b. Cost Centers

      Given the time and the urgency of the threat, the Emergency Management Director may ask the Office of Management & Budget, via the County Manager, to establish and fund any, or all, of the following types of cost centers:

      1) Departmental – This cost center will be used to fund all normal departmental activities in response to, or associated with, the hazardous weather event.

      2) Debris Removal - This cost center draw will be limited only to those activities associated with debris removal, e.g., contractor services or force labor.

      3) Emergency Management – This fund will be directly managed by the Emergency Management Office/EOC Operations. This fund will be used for indirect expenses in response to the event for those items/activities not normally performed by day-to-day government, e.g., shelter operations, outfitting impact assessment teams with safety gear, etc.

2. Governmental/private non-profit agencies not under the Board of County Commissioners, should establish cost-capture mechanisms similar to that described above. When the EOC is activated, all agencies should regularly, or

upon request, report their expenditures so that the total budgetary impact to the County can be related to the State Emergency Operations Center.

C. Exercises & Drills

1. General:

   Generally, during the Statewide Hurricane Exercise, elements of the Flood Warning Program will be tested, and the Post-Exercise Report will highlight those relevant portions of the plan. If the State opts not to conduct a Statewide Hurricane Exercise over a year, then the County Emergency Management Director will develop and conduct one. Exercises and drills must be conducted at least annually to verify the flood warning program and the skills of emergency response personnel. Results of these exercises and drills provide a basis for changes to the flood warning program, implementing procedures, and for further scheduling of training for response personnel. A real-world flooding type event can fulfill the exercise requirement providing a written After-Action Critique was accomplished and timelines for corrective actions were established.

2. Concept of Operations:

   a. Exercise: An exercise is an event that tests the integrated response capability and major elements within the flood warning program. The emergency preparedness exercise will simulate a flood emergency that may result in massive evacuation and sheltering. Generally, exercises will be during the Statewide Hurricane exercise scheduled between April and June of each year.

   b. There are three types of exercises:

      1) Full-scale exercise is designed to fully demonstrate the emergency capabilities of appropriate agencies and organizations. Mobilization of local personnel and resources will be demonstrated.

      2) Functional exercise is designed to demonstrate one or more functions or capabilities specified in the flood warning program. Mobilization of local personnel and resources will be limited.

      3) Table-top exercise is a simulation in which response activities are discussed. There is no mobilization of emergency personnel and resources.

c. Scheduling and Scenario Development

1) Exercises will be scheduled jointly by the response agencies and the Emergency Management Division. Scenarios will be developed with inputs from all participating agencies. Scenarios will be varied from year to year such that all major elements of the flood-warning program are tested during a four-year period. The scenarios will include, but not be limited to the following:

(a) Objectives of the exercise and appropriate evaluation criteria,

(b) Date, time, place and participating organizations,

(c) The simulated event,

(d) A time schedule of real and simulated events,

(e) A narrative summary describing the conduct of the exercises, and

(f) A description of arrangements for advance materials to be provided to observers.

d. Critiques and Reports:

A critique will be conducted after each exercise to evaluate the capability of each participating agency to implement plans and procedures. When written, a copy of the After-Action Report and/or critique will be provided to each county and municipal floodplain manager.

e. Drills:

A drill is a supervised instruction of a supervised instruction period aimed at developing, testing, monitoring technical skills necessary to perform emergency response operations. In addition to the required exercise, drills will be accomplished at the frequencies listed below:

1) Communications between the shelters and the EOC will be conducted at least annually before the hurricane and/or flood season. Communications between agencies, State and other EOCs are conducted daily. The tests of communications with on-scene teams will be part of the flood exercise.

2) Medical drills involving simulated injuries will be conducted as part of the exercise.

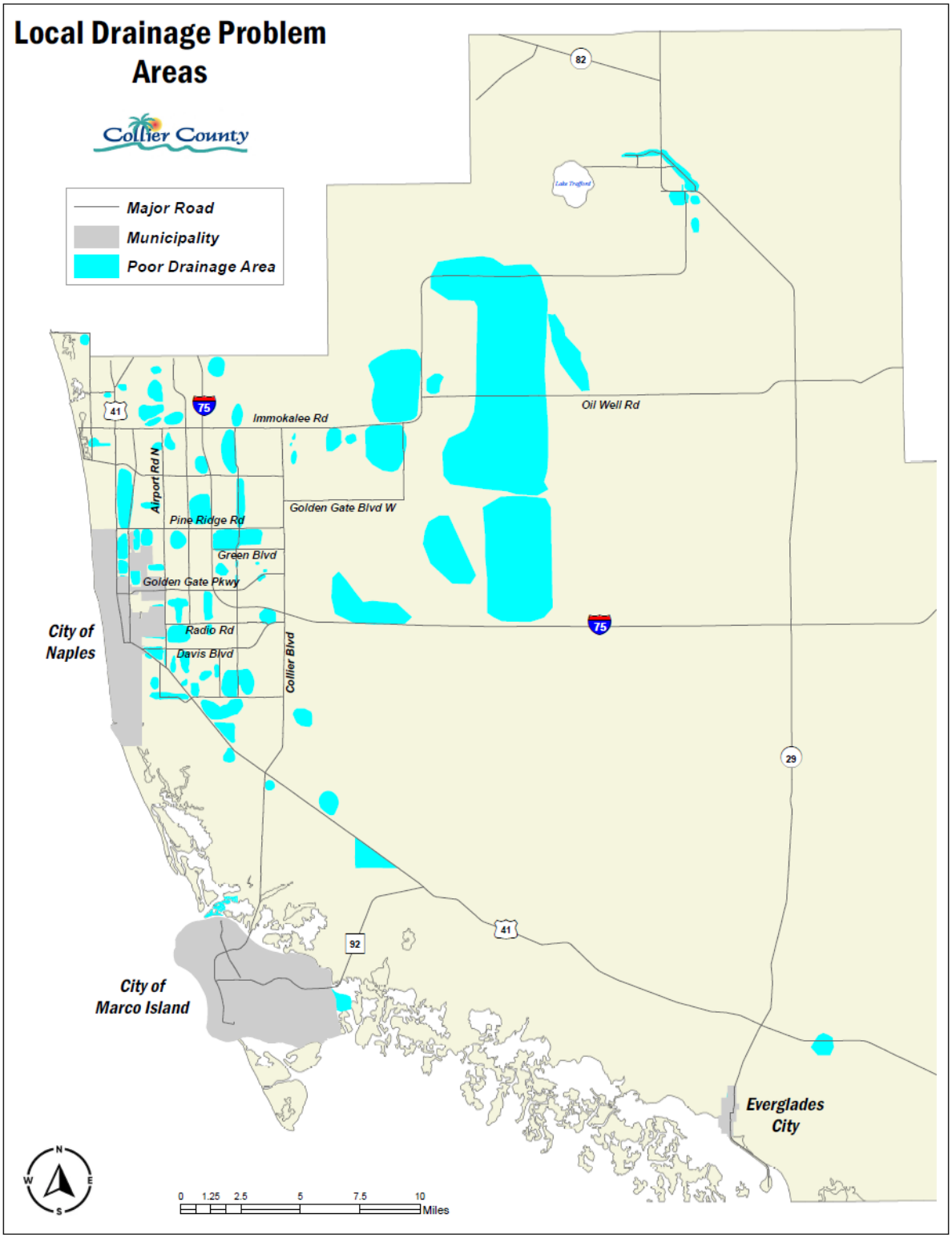
D. Maintenance and Auxiliary Activation of the Collier County Flood Warning Program

The Emergency Management Division will maintain and update this program annually or as required. The program review will be accomplished by May 1st of each year. Portions of this program will be activated periodically to conduct exercises as part of the review process. This is done at least during the annual statewide hurricane exercise.

E. Authorities and References:

1. Public Law 91-606, Disaster Relief Act of 1970
2. Public Law 93-288, Disaster Relief Act of 1984
3. Public Law 100-707, Stafford Act
4. Chapter 252, Florida Statutes, as amended
5. Collier County Ordinance 84-37
6. Mutual Aid Agreement (BCC & Public/Private Schools)
7. Statewide Mutual Aid Agreement

Attachment 1 to ANNEX E
Areas Prone to Rainfall Flooding

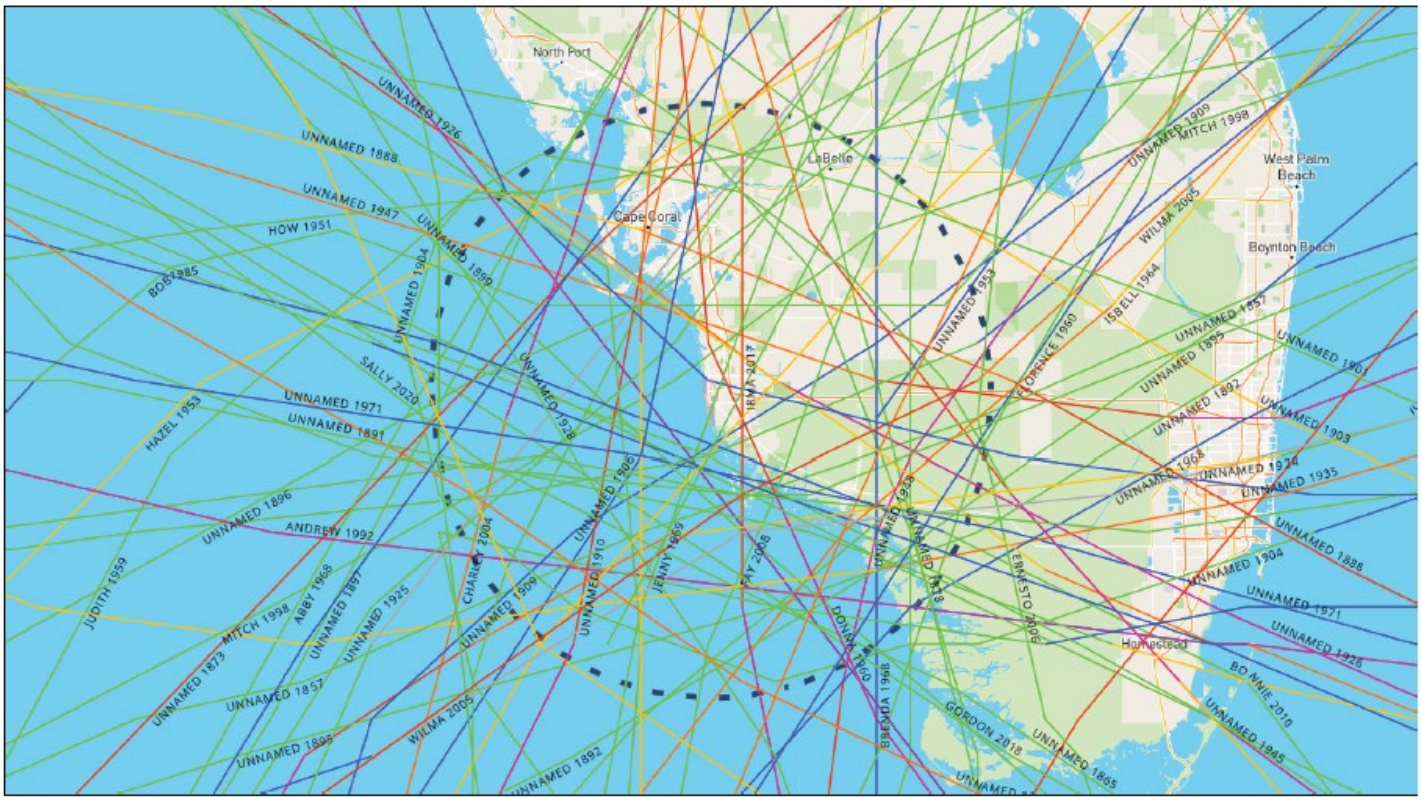


Attachment 2 to ANNEX E

COLLIER'S TROPICAL CYCLONE STORM HISTORY

(W/IN 50 Miles of Naples, 1842 to 2022)

(Note: Hurricane Ian not depicted on chart)



STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
SALLY 2020	Sep 11, 2020 to Sep 18, 2020	95	965	H2
GORDON 2018	Sep 02, 2018 to Sep 07, 2018	60	996	TS
IRMA 2017	Aug 30, 2017 to Sep 13, 2017	155	914	H5
BONNIE 2010	Jul 22, 2010 to Jul 25, 2010	40	1005	TS
FAY 2008	Aug 15, 2008 to Aug 28, 2008	60	986	TS
ERNESTO 2006	Aug 24, 2006 to Sep 04, 2006	65	985	H1

STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
WILMA 2005	Oct 15, 2005 to Oct 26, 2005	160	882	H5
IVAN 2004	Sep 02, 2004 to Sep 24, 2004	145	910	H5
CHARLEY 2004	Aug 09, 2004 to Aug 15, 2004	130	941	H4
HARVEY 1999	Sep 19, 1999 to Sep 22, 1999	50	994	TS
MITCH 1998	Oct 22, 1998 to Nov 09, 1998	155	905	H5
GORDON 1994	Nov 08, 1994 to Nov 21, 1994	75	980	H1
ANDREW 1992	Aug 16, 1992 to Aug 28, 1992	150	922	H5
ANA 1991	Jun 29, 1991 to Jul 05, 1991	45	1000	TS
MARCO 1990	Oct 09, 1990 to Oct 13, 1990	55	989	TS
BOB 1985	Jul 21, 1985 to Jul 26, 1985	65	1002	H1
DENNIS 1981	Aug 07, 1981 to Aug 22, 1981	70	995	H1
UNNAMED 1971	Aug 28, 1971 to Sep 01, 1971	25	-1	TD
JENNY 1969	Oct 01, 1969 to Oct 05, 1969	40	1000	TS
UNNAMED 1968	Sep 25, 1968 to Sep 28, 1968	30	1004	TD
BRENDA 1968	Jun 18, 1968 to Jun 26, 1968	70	990	H1
ABBY 1968	Jun 01, 1968 to Jun 13, 1968	65	992	H1
ISBELL 1964	Oct 09, 1964 to Oct 16, 1964	100	964	H3
FLORENCE 1960	Sep 17, 1960 to Sep 26, 1960	50	1000	TS
DONNA 1960	Aug 29, 1960 to Sep 14, 1960	125	930	H4
JUDITH 1959	Oct 14, 1959 to Oct 22, 1959	75	988	H1
HAZEL 1953	Oct 07, 1953 to Oct 16, 1953	75	989	H1
UNNAMED 1953	Jul 11, 1953 to Jul 16, 1953	45	-1	TS
HOW 1951	Sep 29, 1951 to Oct 11, 1951	85	963	H2
UNNAMED 1948	Sep 18, 1948 to Sep 26, 1948	115	940	H4
UNNAMED 1947	Sep 04, 1947 to Sep 21, 1947	125	938	H4
UNNAMED 1945	Sep 12, 1945 to Sep 20, 1945	115	949	H4
UNNAMED 1945	Sep 03, 1945 to Sep 06, 1945	35	-1	TS
UNNAMED 1941	Oct 03, 1941 to Oct 13, 1941	105	962	H3

STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
UNNAMED 1936	Jul 27, 1936 to Aug 01, 1936	90	964	H2
UNNAMED 1936	Jun 12, 1936 to Jun 17, 1936	40	996	TS
UNNAMED 1935	Oct 30, 1935 to Nov 08, 1935	90	964	H2
UNNAMED 1935	Aug 29, 1935 to Sep 10, 1935	160	892	H5
UNNAMED 1932	Aug 26, 1932 to Sep 04, 1932	75	979	H1
UNNAMED 1929	Sep 19, 1929 to Oct 05, 1929	135	924	H4
UNNAMED 1928	Aug 07, 1928 to Aug 17, 1928	80	-1	H1
UNNAMED 1926	Sep 11, 1926 to Sep 22, 1926	130	930	H4
UNNAMED 1925	Nov 27, 1925 to Dec 05, 1925	55	980	TS
UNNAMED 1924	Oct 14, 1924 to Oct 23, 1924	145	910	H5
UNNAMED 1921	Oct 15, 1921 to Oct 24, 1921	60	-1	TS
UNNAMED 1916	May 13, 1916 to May 18, 1916	40	990	TS
UNNAMED 1910	Oct 09, 1910 to Oct 23, 1910	130	924	H4
UNNAMED 1909	Sep 24, 1909 to Sep 29, 1909	50	-1	TS
UNNAMED 1907	Sep 18, 1907 to Sep 23, 1907	40	-1	TS
UNNAMED 1906	Oct 08, 1906 to Oct 23, 1906	105	953	H3
UNNAMED 1904	Oct 12, 1904 to Oct 21, 1904	70	-1	H1
UNNAMED 1903	Sep 09, 1903 to Sep 16, 1903	80	976	H1
UNNAMED 1901	Aug 02, 1901 to Aug 18, 1901	80	973	H1
UNNAMED 1899	Jul 28, 1899 to Aug 02, 1899	85	979	H2
UNNAMED 1897	Sep 20, 1897 to Sep 25, 1897	60	-1	TS
UNNAMED 1896	Oct 07, 1896 to Oct 16, 1896	85	-1	H2
UNNAMED 1895	Oct 13, 1895 to Oct 17, 1895	35	-1	TS
UNNAMED 1894	Sep 18, 1894 to Oct 01, 1894	105	985	H3
UNNAMED 1892	Jun 09, 1892 to Jun 16, 1892	45	-1	TS
UNNAMED 1891	Oct 07, 1891 to Oct 16, 1891	40	-1	TS
UNNAMED 1891	Oct 04, 1891 to Oct 10, 1891	45	1004	TS
UNNAMED 1891	Aug 18, 1891 to Aug 25, 1891	110	961	H3

STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
UNNAMED 1888	Aug 14, 1888 to Aug 24, 1888	110	-1	H3
UNNAMED 1887	Aug 31, 1887 to Sep 04, 1887	35	-1	TS
UNNAMED 1878	Sep 01, 1878 to Sep 13, 1878	90	970	H2
UNNAMED 1878	Jul 01, 1878 to Jul 03, 1878	40	-1	TS
UNNAMED 1876	Oct 12, 1876 to Oct 23, 1876	100	958	H3
UNNAMED 1873	Sep 26, 1873 to Oct 10, 1873	100	959	H3
UNNAMED 1870	Oct 19, 1870 to Oct 22, 1870	90	-1	H2
UNNAMED 1865	Aug 26, 1865 to Aug 30, 1865	35	-1	TS
UNNAMED 1861	Nov 01, 1861 to Nov 03, 1861	70	999	H1
UNNAMED 1861	Aug 09, 1861 to Aug 18, 1861	80	982	H1
UNNAMED 1857	Aug 16, 1857 to Aug 23, 1857	65	-1	H1

These historical tropical cyclone tracks (https://coast.noaa.gov/hurricanes/#map=4/32/-80) occurred between the years of 1842 and 2022 within 50 miles of the City of Naples, Florida.

- There were 39 tropical storms, averaging one every 4.6 years
- There were 41 hurricanes, averaging on every 4.3 years
- There were 18 major hurricanes (categories 3 – 5), averaging one every 10 years.

Attachment 3 to ANNEX E

Disaster Resource Unit (DRU) **--- ITEM---**	**Required**
A/C Unit (Soleus Air/MAC 7500 BTU)	1
A/C Unit (10,000 BTU)	1
Air Mattress, Coleman, Twin Quick Bed	30
Air Pump, Coleman, 4D Deluxe	2
Batteries, "AAA"	20
Batteries, "AA"	0
Batteries, "D"	22
Batteries, 6 Volt	6
Blankets, Standard (polyester, 60" X 90"),	90
Bins	8
Bio Hazard Bags	20
Body Transport Bag, 20 ml thick, 6 strap handles	2
Buckets 5-Gal, Plastic w/handle	2
Clorox Wipes	1
Cold Drink Container, 5 Gal	1
Cone, Traffic, 36"	2
Cooler 70 Quart	1
Cots, Military, Oversize	50
Cots, PSN, Standard	4
Diagonal Pliers, 6"	1
DRU Manual	1
Duct Tape	1
Fire Extinguisher	1
First Aid Kit	1
Flashlight	6
Flashlight, Multi-Functional	6
Floor Fans	2
Garbage Bags, Case, 55 gal Gas Can, 5 Gal, Safety Generator, Honda 5000 W (handles) (72db) Gloves, cotton Gloves, leather Hand Towel 20"X40" Hand Truck (400lbs, D handle) Hydraulic Jack, 4 ton Lantern Light, Luna Pro, 70 watt Lug Wrench	1 2 1 4 4 100 1 1 4 3 1

Mats, Sleeping, Standard	50
Padlocks, Combination	4
Picture Board	2
Power Cords Reel in 100', Heavy Duty, Triple Outlet	4
Pump, Multi-use	1
Radio, All Hazards Alert	1
Radio, Emergency AM/FM/TV Band Radio with NOAA,	1
Radio, Shelter to EOC	1
Ratchet Strap,Buckle Ratchet 3000 lb strength	3
Red Cross Comfort Kits	72
Respirators, N-95	50
Sheets (Disp) Flat-Twin 130 count 54"X90"	48
Shelter Kit	1
Tape, Caution, 3" 1000 Ft roll	1
Tarps, 20' x30'	2
Tool Set (hammer, saw, screwdrivers, wrenches, pliers, etc)	1
Transfer Belts	5
Trash Can, 50gal.	1
Urinals, Female	5
Urinals, Male	5
Walkers	2
Walkie Talkies	4
Wash Cloth, 12" X 12"	100
Wheelchairs	2
Wheel Chalk, set	1
Wheel Lock	1
Wrist Bands	100

Attachment 4 to Annex 3

Road & Bridge Division Flood Response Resources

In addition to the use of contracted services for the majority of weed and grass control by spraying, Road Maintenance has in-house crews for clearing canals and drainage ways (swales, easements, etc.) and structures:

- Brush and tree trimming and removal;
- Debris removal;
- Cleaning and repairing structures; and
- Digging out/reshaping of canals, ditches and swales

Road Maintenance also has on hand equipment and material that can be used in flooding situations. This includes:

- Sand Bagger Machine and sandbags
- 2 Jet Vac Trucks
- 120 tons of sand in stock
- 120 tons of gravel in stock
- 1100 tons of lime rock in stock
- 75 "Water Over Road" signs on barricades
- 4 - Wheel Loaders
- 2 – Backhoe Loader Combos
- 1 – 66' Extended Reach Track Hoe
- 1 – Large Tracked Bulldozer
- 2 – Large Grabber Trucks
- Pumps
    - 6" Diesel powered hydraulic pump
    - 3" Gas powered hydraulic pump
    - 4" Gas powered hydraulic pump
    - 2 – 3" Gas powered centrifugal pumps
- Bush Hog Flex Wing Rotary Mower

- 2 Mud- Hogs
- 28 dump trucks
- Machete Tractor
- Menzi Muck Excavator (All Terrain)
- 5-John Deere excavators
- 2-Gradall Excavators